"The individual protective layers are typically 1 nm thick, preferably from 40 to 200 nm thick and exhibit in particular a thickness which is a fraction e.g. $\lambda/2$ or $\lambda/4$ of the wavelength of the radiation to be reflected."

[Emphasis supplied]

The thickness of the protective layer can be $\lambda/2$ or $\lambda/4$ of the wavelength of the radiation.

Column 8, lines 52 to 56, of Patent '561 states:

"The reflective layer c) on the reflector body via layer b) serves in particular to reflect energy in the form of waves and/or particles, usefully for reflecting radiation having wave lengths in the optical range, preferably visible light, in particular that having wave lengths of 400 to 750 nm."

[Emphasis Supplied]

Therefore, an example of the thickness of the protective layer is 375 nm, i.e., $\lambda/2 = 750$ nm/2. Note that a thickness of 375 nm is larger than 200 nm, the upper value of the preferred thickness range.

Patent '561 discloses reflection of "energy in the form of waves". Needless to say, such disclosure covers all of the types of encompassed radiation or energy in wave form, and their ranges of wave length. The types of energy in the form of waves and their ranges of wave length are in the literature and known to one skilled in the art. The wave lengths at the lower and higher points of such ranges supply further examples, by means of $\lambda/2$ and $\lambda/4$ calculation, of the disclosed thickness of the protective layer.

The specification of Patent '561 provides further examples of the thickness of the protective layer, namely, 1 nm, 40 nm, 200 nm, 100 nm, (i.e., 400/4), 200 nm (i.e., 400/2) and 187.5 nm (i.e., 750/4).

Patent '561 further states:

> "The reflectors according to the invention having surfaces that bear such a reflective layer or multilayer system exhibit excellent reflectivity for example of <u>electromagnetic radiation, especially electromagnetic radiation in the visible light range. The optical range includes e.g. infra-red range, the visible light range, ultra violet etc. The preferred range for application is that of electromagnetic radiation and thereby the visible light range.</u>" [Emphasis Supplied] [Col. 9, lines 24 to 31]

The radiation to be reflected includes electromagnetic radiation with some emphasis on the "optical range", that includes infrared light, visible light and ultra violet light. Patent '561 states:

> "The present invention includes also the use of reflectors having a surface resistant to mechanical and chemical attack and high total reflectivity for the reflection of <u>radiation in the optical range i.e. daylight and artificial light, thermal radiation, visible light, ultra violet light</u> etc. Of particular importance is the use of reflectors for reflecting <u>visible light in particular daylight or artificial light, including UV light</u>." [Emphasis Supplied] [Col. 10, lines 5 to 12]

Thermal radiation wave lengths come within the wave length range of the optical range. Patent '561 states:

"Layers a) produced this way can be produced with a precisely prescribed layer thickness, pore-free, homogenous, and with regard to the electromagnetic radiation, transparent, in particular in the visible and/or infra-red range." [Emphasis Supplied] [Col. 4, lines 63 to 67]

Patent '561 states:

"The metallic reflective layer (13), or layer system comprising metal reflecting layer (17) and protective layers (16), is deposited on the functional layer (12). A ray of light (15) penetrates the transparent protective layers (16), which are sketched in here and are in particular transparent, and is reflected by the metal reflecting layer (17)." [Emphasis Supplied] [Col. 10, lines 35 to 40]

"For that reason the reflectors according to the invention are suitable e.g. as reflectors such as those for radiation sources or optical equipment. Such radiation sources are e.g. lights such as work-place lights, primary lights, secondary lights, strip lights with transvers reflectors, light elements, lighting covers, light deflecting fins or thermal radiators. The reflectors may also e.g. be mirrors or internal mirrors in optical equipment, lighting components or thermal radiators." [Emphasis Supplied] [Col. 10, lines 34 to 42]

Infrared light has a range of wave length of 780 to 300,000 nm. Encyclopedia Britannica, Micropaedia, Vol. V, (1974), page 353, (copy enclosed), states:

"**infrar d light**, that portion of the electromagnetic spectrum adjacent to the long wave length, or red end of the visible light range....The infrared range is usually divided into three regions: near infrared (nearest the visible spectrum), with wavelengths 0.78 to 5.0 microns (a micron, or micrometre, is 10^{-6} metre); middle infrared, with wavelengths 3 to 30 microns; and far infrared, with wavelengths 30 to 300 microns. Most of the radiation emitted by a moderately heated surface is infrared light; it forms a continuous spectrum." [Emphasis Supplied]

Therefore, examples of the thickness of the protective layer are 1,500 nm (i.e., 3,000/2), 750 nm (i.e., 3,000/4), 15,000 nm (i.e., 30,000/2), 7.5000 nm (i.e. 30,000/4), 150,000 nm (i.e., 300,000/2), and 75,000 nm (i.e., 300,000/4).

Ultraviolet light has a range of wavelength of 10 to 380 nm. Encyclopedia Britannica, Micropaedia, Vol. X, (1974), page 247, (copy enclosed), states:

"**ultraviolet light**, that portion of the electromagnetic spectrum adjacent to the short wavelength, or violet end of the visible light range. ...The ultraviolet spectrum is usually divided into two regions: near ultraviolet (nearer the visible spectrum), with wavelengths 2000 to 3800 angstrom units (one angstrom is 10^{-10} metre, or 0.1 nanometre); and far ultraviolet, with wavelengths 100 to 2000 angstrom units." [Emphasis Supplied]

Therefore, examples of the thickness of the protective layer are 2.5 nm (i.e., 10/4), 5 nm (i.e., 10/2), 100 nm (i.e., 200/2) and 50 nm (i.e., 200/4).

One skilled in the art would consider the numerical range of 1 nm to 150,000 nm for the thickness of the individual protective layers to be inherently supported by applicants' original disclosure. MPEP 2163.05 states:

"III. RANGE LIMITATIONS"

> "With respect to changing numerical range limitations, the analysis must take into account which ranges one skilled in the art would consider inherently supported by the discussion in the original disclosure. In the decision in *In re Wertheim*, 541 F2d 257, 191 USPQ 90 (CCPA 1976), the ranges described in the original specification included a a range of '25% - 60%' and specific examples of '36%' and '50%.' A corresponding new claim limitation to 'at least 35%' did not meet the description requirement because the phrase 'at least' had no upper limit and caused the claim to read literally on embodiments outside the '25% to 60%' range, however a limitation to 'between 35% and 60%' did meet the description requirement."

Entry of the amendment is requested as the finality of the Office Action is premature, as shown above.

The amendment filed on July 2, 2002 has been objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. Applicants traverse this objection.

The preliminary amendment was mailed by certificate of mailing dated June 26, 2002, which is therefore the date it was timely filed in the Patent Office, See Rule 8. The actual date received by the patent Office was apparently July 2,

2002. Applicants will use the latter date for conformity of reference (as per Rule 8).

The Office Action stated 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. New matter has not been inserted by amendment, as shown previously and below.

Nothing was amended by the preliminary amendment filed on July 2, 2002, so this objection is in error. Therefore, the Examiner has prematurely gone final. Applicants request that the final status of the Office Action be withdrawn and that a new nonfinal Office Action be issued (if the application is not allowed).

The Examiner has objected to the wrong amendment. The amendment that amended the specification is the one made at the time the reissue application was filed (i.e., July 5, 2001) by physically incorporating the change into the specification. 37 CFR 1.173 (b) states:

> "(b) *Making amendments in a reissue application.* <u>An amendment in a reissue application is made either by physically incorporating the changes into the specification when the application is filed</u>, or by a separate amendment paper. If amendment is made by incorproaton, markings pursuant to paragraph (d) of this section must be used. If amendment is made by an amendment paper, the paper must direct that specified changed be made." [Emphasis Supplied]

The Office Action stated: that, in reference to the objection of the amendment filed on July 2, 2002 under 35 U.S.C. 132, because it introduced new matter in the disclosure, applicants argue that the Preliminary Amendment

dated July 2, 2002 (not as dated June 26, 2002 which appears to be in error) did not amend anything but instead set out the basis for the amendment in the specification when the reissue application was filed; and that on this ground alone this objection is in error. Applicants traverse this statement and refer to Rule 173(b). While applicants disagree with the ground of the objection, applicants point out that the objection should have been to the amendment to the specification at the time the reissue application was filed. The present objection to the preliminary amendment, filed on July 2, 2002, is defective because the preliminary amendment did not amend anything.

The date of the preliminary amendment was June 26, 2002 because that is the date of the certificate of mailing – the date of July 2, 2002 is the date it was filed via the fiat of the second sentence of Rule 8.

The Office Action stated: that the Examiner agrees with applicants that the Preliminary Amendment filed on July 2, 2002 did not amend the specification; that, however, there is no amendment in the file to show when and how the specification was amended; and that, if the Preliminary Amendment filed on July 2, 2002 did not amend the specification, the applications should provide when and how the specification was amended. The specification of the reissue application was amended on the date (i.e., July 5, 2001) that the reissue application was filed and that, pursuant to Rule 173(b), the specification was made by physically incorporating the change into the specification when the reissue application was filed. The language of Rule 173(b) provides the basis for identifying the amendment under discussion.

The Office Action stated that the added material which is not supported by the original disclosure is as follows: column 8, lines 28, changing the phrase "protective layers are typically 1 nm thick" to the phrase – protective layers are typically from 1 nm thick – introduces new matter because the addition of the word "from" to the phrase allows the thickness range of the protective layers to open ended while the original phrase limits to "1 nm thick protective layers." Applicants traverse this statement because new matter is not involved.

Dependent Claim 12 in U.S. Patent No. 5,919,561 (Patent '591) states:

> "12. The reflector according to claim 1, wherein the reflective layer (c) is a multilayer system comprising a reflecting layer and deposited on that <u>transparent protective layers</u> with different refractive indices." [Emphasis supplied]

Dependent Claim 12 does not recite any thickness or thickness range for the transparent protective layer or layers. The thickness of the transparent protective layer in dependent claim 12 is "open ended" in both directions. This shows that the disclosure of Patent '591 teaches that the upper side of the thickness (range) of the transparent protective layer can be so-called "open ended". It would be obvious to one skilled in the art that the recitation "typically 1 nm thick" was an error and illogical when the transparent protective layer was "preferably from 40 to 200 nm thick". One skilled in the art would not typically use a one nm thickness when the preferred thickness is from 40 to 200 nm (the preferred thickness being at least 40 fold greater than the typical thickness). It is illogical and against the practice in the packaging/material/chemical fields and the patent

filed to have the typical thickness being a single point value that is very far outside of the preferred range and does not cover the preferred range. The practice in the art is for the general/typical range to encompass the preferred range. One skilled in the art would readily ascertain the obvious error, and would readily see that the open endedness in dependent Claim 12 provided for the correction of the error (and remove the illogic situation caused by the subject error). The rule in In re Oda et al. is thereby followed and complied with by correcting the error to recite "typically more than 1 nm thick". The disclosure of Patent '591 directs the correction of the subject error caused by the translation error.

Dependent Claim 13 in Patent '591 states:

> "13. The reflector according to claim 1, wherein the reflective layer (c) is a multilayer system comprising a reflecting layer and deposited thereon transparent protective layers with different refractive indices, the reflective layer being 10 to 200 nm thick and <u>each of the transparent protective layers being 40 to 200 nm thick</u>."[Emphasis supplied]

This is the preferred thickness range. It is clearly illogical to one skilled in the art that the typical thickness (range) would not encompass the preferred thickness (range).

The pattern of the recitation of the thickness of the transparent protective layer in column 8 of Patent '591 also supports the amendment as not being new matter. Column 8, lines 28 and 29, recites "... are typically [?] 1 nm thick, preferably <u>from</u> 40 to 200 nm thick..." [Emphasis supplied] That sentence also

evidences that its structure would be missing the word "from" the typical thickness range recitation (which is in line with the open endedness of dependent Claim 12).

The pattern used by the other thickness ranges in Patent '561 has the preferred or advantageous thickness ranges within the span or scope of the general or typical thickness ranges – see column 2, lines 64 to 66, (reflector bodies), column 3, lines 19 to 34, (pre-treatment layer), column 5, lines 50 to 59, (aluminum oxide layer), and column 9, lines 13 to 15, (oxide-containing bonding layer).

Roman Fuchs is one of the joint inventors in U.S. Patent No. 5,919,561 (the patent for which this reissue application was filed). Column 1, lines 34 to 46, of Patent '561 discusses the disclosure of European Published Application No. 0495755 A1 (European '755). Roman Fuchs is also one of the joint inventors in European '755. The publication date of European '755 is in July 1992.

The discussion of European '755 in Patent '561 discloses objects having an aluminum surface, upon which is sequentially located a bonding layer (e.g., a ceramic layer), a light-reflecting layer (e.g., a metallic layer, e.g., aluminum), and "one or more transparent protective layers of metallic compounds".

European '755 is based upon Swiss Patent Application No. 68/91 (filed on January 1, 1991). U.S. Patent No. 5,403,657 (Patent '657), 5,527,572 and 5,663,001 each claim the priority of Swiss Patent Application No. 68/91 and each has the effective U.S. filing date of December 23, 1991. The first two mentioned

U.S. patents have publication dates before applicants' U.S. filing and Swiss priority filing dates. Roman Fuchs is one of the joint inventors in all three of such U.S. patents.

All three of such U.S. patents have the same disclosure as that of European '755 of objects having an aluminum surface, upon which is sequentially located an optional adhesive layer (e.g., a metallic layer), and at least one transparent protective layer (e.g., of various metallic compounds). The following discussion of Patents '657 equally applies to the other two of such U.S. patents.

Column 3, lines 44 and 45 , of Patent '657 states:

> "The individual layers are typically 1 to 200 nm, preferably 1 to 100 nm thick."

One skilled in the art and joint inventor Roman Fuchs use typical thickness ranges that span or encompass preferred thickness ranges. It is illogical otherwise and would indicate an obvious error to one skilled in the art.

A copy of U.S. Patent Nos. 5,403,657, 5,527,572 and 5,663,001 and European Published Patent Application No. 0495755 A1 was earlier supplied. The knowledge possessed by one skilled in the art can be established by reference to patents available to the public before applicants' filing date – see In re Lange (that involved a new matter issue).

The Office Action stated that applicants are required to cancel the new matter in the reply to this Office Action. Applicants traverse this requirements because no new matter is involved.

This objection should be withdrawn.

Claims 1 to 15 have been rejected under 35 U.S.C. 251 as being based upon new matter added to the patent for which reissue is sought. Applicants traverse this rejection and have shown herein that new matter is not involved.

The Office Action stated that the added material which is not supported by prior patent is as follows:

Column 8, lines 28, changing the phrase "protective layers are typically 1 mn thick" to the phrase – protective layers are typically from 1 nm thick – introduces new matter because the addition of the word "from" to the phrase allows the thickness range of the protective layers to be open ended while the original phrase limits to "1 nm thick protective layers".

Applicants traverse this statement. The added material is supported by the disclosure of Patent '591 and the knowledge of one skilled in the art. In re Oda et al. and In re Lange support applicants' position that new matter is not involved. The Examiner's position is clearly in error and unsupported by the evidence.

The applicants' discussion and evidence above under the objection are incorporated here so as not to be redundant.

The Office Action stated: that, in reference to the new matter rejection, applicants points to the C.C.P.A., In re Lange, 644 F.2d 856, and In re Oda et al., 170 USPQ 268 (C.C.P.A. 1971), and argue that the dependent Claim 12 does not recite any thickness or thickness range for the transparent protective layer or layers; that the thickness of the transparent protective layer in dependent Claim 12 is "open ended" in both directions; that this shows that the disclosure of U.S.

Patent No. 5,919,561 teaches that the upper side of the thickness (range) of the transparent protective layer can be so-called "open-ended"; that it would be obvious to one skilled in the art that the recitation "typically 1 nm thick" was an error and illogical when the transparent protective layer was "preferably from 40 to 200 nm thick", that one skilled in the art would not typically use a one nm thickness when the preferred thickness is from 40 to 200 nm; that applicants also points to U.S. Nos. Patents 5,403,657, 5,527,572 and 5,663,001 wherein one of joint inventors Roman Fuchs of this Patent No. 5,919,561 is also a joint inventor and these patents disclose individual layers are typically 1 to 200 nm, preferably 1 to 100 nm thick, and that, thus, one skilled in the art and joint inventor Roman Fuchs use typical thickness ranges that span or encompass preferred thickness range. Applicants' points and positions are correct and show that no new matter is involved.

The Office Action stated: that these arguments are unpersuasive because the recited cases are related to the typographical errors, which are different that in the instant case. Applicants traverse this statement. The cases relied upon by applicants are apropos to the issues at bar. The Preliminary Amendment presented analysis and evidence that one skilled in the art would appreciate that the error was present, what the error was and how to correct it – this meets the requirements of In re Oda et al. so the amendment did not involve new matter. Applicants have herein, and in the 3/12/03 amendment, presented further reasons and evidence to show that new matter is not involved. Applicants have complied with the requirements of In re Oda et al. and In re Lange to show by

reasons and evidence that new matter is not involved. Furthermore, under the circumstances of the case at bar the Board Ex parte Boudious decision is not controlling or even apropos. The later decisions of In re Oda et al. and In re Lange of the C.C.P.A. are the controlling and apropos decisions.

The Office Action stated that, in Claim 12, the thickness of the protective layer is not recited and therefore it is open ended argument is unpersuasive because, when thickness is not recited in the claim, one skilled in the art would use the disclosure as a dictionary to find thickness. This statement is partially incorrect. One skilled in the art, when looking at Claim 12, would be guided by the disclosure to look for the thickness, including the extremes of the thickness range, that provide operable results, process, product, etc., and that fulfill the objects and purposes of the claimed invention. Applicants have above shown disclosure support for range and many examples. The Examiner's statement is incorrect in law and fact.

The Office Action stated that, in the instant case, the protective layer(s) can be either 1 nm thick or from 40 to 200 nm thick. Applicants traverse this statement in view of the examples shown above.

The Office Acton stated that there is no evidence showing that the thickness of the protective layer can be higher than 200 nm, that are encompassed by the open-ended limitation. Applciants traverse this statement and have shown above that the evidence shows larger thickness.

The Office Action stated that, further, there is no affidavit of fact b an expert providing showing that the thickness of the protective layer can be open-

ended. This statement is not pertinent. The inherent examples show a thickness of 150,000 nm, etc. No expert declaration is necessary as applicants' disclosure shows and supports the claims and the amendments to the specification.

The Examiner has misanalyzed the In re Oda et al. decision and incorrectly attempted to limit in re Oda et al. to its particular set of facts. In re Oda et al. expressly sets out the broad principals and procedures for determining if any particular amendment does or does not constitute new matter. Specifically, In re Oda et al. states:

> "On all the evidence, we conclude that one skilled in the art would appreciate not only the existence of error in the specification but what the error is. As a corollary, it follows that it is also known how to correct it. We therefore disagree with the board's first conclusion that the change of 'nitrous' to 'nitric' is 'new matter.'"
>
> "We also think there is adequate evidence in the record to show that the error in saying 'nitrous' instead of 'nitric' was a translation error." [Emphasis supplied] [Page 272]

In re Oda et al. dealt with a translation error and set out the principles and procedures of how to determine whether or not new matter was present. The Examiner has not followed the analysis, principles, etc., required by In re Oda et al. (and In re Lange). The present objection and rejection are defective. For example, the Examiner did not deal with or mention the following from the Preliminary Amendment:

"The error was that the translator left the word 'from' out of the phrase 'are typically from 1 nm thick, preferably from 40 to 200 nm thick' (in German). One skilled in the art would know that an error was present in the phrase 'are typically 1 nm thick, preferably from 40 to 200 nm thick,'. That is, it appears to be an error to say that the (each) transparent protective layer typically has a thickness of 1 nm when the preferred thickness range is from 40 to 200 nm. Note that Claim 12 does not contain any thickness value or range for any of the transparent protective layers of reflective layer (c). [Emphasis supplied] [Page 1 and 2]

The Examiner's attention is also drawn to the following:

M.P.E.P. 2163 states:

"While there is no *in haec verba* requirement, newly added claim limitations must be supported in the specification through express, implicit, or inherent disclosure. An amendment to correct an obvious error does not constitute new matter where one skilled in the art would not only recognize the existence of the error in the specification, but also recognize the appropriate correction. *In re Oda*, 443 F.2d 1200, 170 USPQ 268 (CCPA 1971)." [Emphasis Supplied]

This summarization of In re Oda et al. is incorrect because In re Oda et al. states:

"As a corollary, it follows that when the nature of this error is known it is also known how to correct it." [Emphasis supplied] [Page 272]

M.P.E.P. 2163.05 states:

"With respect to changing numerical range limitations, the analysis must take into account which ranges one skilled in the art would consider inherently supported by the discussion in the original disclosure."

The Examiner has erroneously, without any justification, attempted to restrict the application of In Re Oda et al. to the specific or type of fact situation involved in In Re Oda et al. As applications have shown above, In re Oda et al. is not so restricted. In re Oda et al. sets out broad principles and procedures to be used in determining whether or not new matter is involved. In re Oda et al. is not limited to its specific facts or factual type of situation. Furthermore, In re Lange stated that one skilled in the art and such person's knowledge (as shown, for example, by prior patents) had to be considered and examined in determining if new matter was or was not present.

This reissue application seeks to reissue U.S. Patent No. 5,919,561 to correct an error which resulted from the translation into English of the German language priority Swiss patent application. The translator erroneously did not translate the German word "von" so the English translation comprising the U.S. application underlying U.S. Patent No. 5,919,561 left out the English word "from." The details are set out in the reissue application declaration (and supplemental declaration) and the declaration of the translator, both of record.

The mistranslation sought to be corrected does not involve any claim or claim limitation or any preferred range. The error in the specification was that the translator left the word "from" out of the phrase "are typically from 1 nm thick, preferably from 40 to 200 nm thick" (in German). One skilled in the art would

know that an error was present in the phrase “are typically 1 nm thick, preferably from 40 to 200 nm thick.” That is, it appears to be an error to say that the (each) transparent protective layer typically has a thickness of 1 nm when the preferred thickness range is from 40 to 200 nm. Note that Claim 12 does not contain any thickness value or range for any of the transparent protective layers of reflective layer .

In the case of In re Oda et al., 170 USPQ 268, (C.C.P.A. 1971), mistranslations were made in preparing the U.S. application in English from corresponding Japanese applications. The patentees in such instance filed a reissue application to correct the U.S. patent. The C.C.P.A. ruled that correction of such mistranslation was not “new matter” and allowed the compound claims of the reissue application. The translator’s error in the case a bar is clearly analogous and comes within the In Re Oda et al. doctrine. There is more than adequate and convincing evidence in the record to show that no new matter is involved.

This rejection should be withdrawn.

Reconsideration, reexamination and allowance are requested.

Respectfully submitted,

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Date: Sept. 3, 2003

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that infection with one type confers no immunity against another. Influenza tends to occur in wavelike epidemics throughout the world: influenza A tends to reappear in cycles of two to three years and influenza B in cycles of four to five years; influenza A_2, or Asian flu, apparently began in China early in 1957, and by midyear it had circled the globe.

Influenza may affect individuals of all ages and is generally more frequent during the colder months of the year. The infection is transmitted from person to person through the respiratory tract, by such means as inhalation of infected droplets resulting from coughing and sneezing. The onset of influenza with its characteristic symptoms tends to be sudden, and the acute phase of the infection is ordinarily over in three to four days. Mortality is commonly low, resulting in most cases from complications such as pneumonia, usually among the elderly, who are weakened by debilitating disorders.

There is no specific treatment for influenza; drugs such as aspirin and codeine sulfate are used to relieve discomfort and to control the fever. Individual protection against influenza may be bolstered by injection of a vaccine of influenza viruses. These viruses are produced in chick embryos and rendered noninfective; standard commercial preparations in the United States ordinarily include the type B influenza virus and all three of the A subtypes. Protection from one vaccination seldom lasts more than a year, and yearly vaccination is recommended, particularly for those individuals who are unusually susceptible to influenza or whose weak condition could lead to serious complications in case of infection.

·diseases of animals, tables 5 and 9 5:874
·maternal deaths during pregnancy 14:979h
·respiratory system virus infections 15:770d
·vaccines for different strains 11:834g
·viral nature of epidemics 19:169a
·viral strains and disease symptoms 9:548d

Infonac, acronym for INSTITUTO DE FOMENTO NACIONAL, translated as INSTITUTE FOR NATIONAL DEVELOPMENT, a Nicaraguan establishment that extends partial credit for industry, agriculture, and cattle raising.

·credit issuing services 13:62a

informal school, or FREE SCHOOL, school in which the teaching system is based on an environment structured to encourage the child to become actively involved in the learning process. The informal school stresses individualized rather than group instruction, and children proceed from one step to another at their own rate of development. The teacher plays a central role, and the difficulty of handling the diverse interests of the pupils puts off many traditionally trained teachers. The school day is not divided into rigid timetables as in a traditional classroom. At the teacher's discretion and under his guidance children are engaged individually or in small groups in a wide variety of activities for longer periods of time than the usual class meeting. Talking and moving about are not forbidden—in fact, physical activity and conversation are necessary to this type of learning.

In Great Britain the method has become common since the end of World War II. In 1967 a report of the Central Advisory Council for Education encouraged all English primary schools to adopt informal schooling methods. (Primary schools in Britain include children up to 12 years old.)

information processing 9:567, techniques by which information is collected, stored, and made available.

The text article covers problems associated with the proliferation of knowledge in the modern world; primary information media such as scholarly journals, newsletters, and microfiche collections; and secondary media such as abstracts and reviews. It also covers techniques for indexing and classifying technical material to facilitate storage and retrieval and the technology of processing and storing information for future reference.

REFERENCES in other text articles:

·aerospace equipment units and design development 1:135e *passim* to 136g
·air traffic control methods 18:643e
·auto congestion and economic solutions 14:1006h
·automation and computer use 2:512a
·automation's work organization effect 19:940g
·biological prototypes for technology 2:1033b
·Chess and automation 4:204h
·communication models and theory 4:1006g
·computer development and operation 4:1046f
·computers in lexicography 5:721f
·contemporary typewriter extensions 18:810b
·control system data handling 5:130c
·cryptological methods and devices 5:322e
·data collection and capture in social sciences 9:784c
·development of systems engineering 17:971c
·ferrite computer memory systems 7:249c
·flight data processing and automation 18:578b; illus.
·high fidelity in telecommunications 18:87c
·industrial monitoring instrumentation 9:639f
·information theory basis 9:574f
·instrumentation history and technology 9:632h
·integrated circuit systems 9:661c
·library science technical development 10:867d
·magnetic information storage 11:339f
·mathematical calculation theory and use 11:691a
·microform suitability for library use 10:872f
·optimization theory and method 13:632h
·perception–response as analogous 14:39d
·persuasion and communications theory 14:123e
·police record computerization 14:673g; illus.
·printing's relation to other media 14:1051h
·telegraphic data transmission 18:76b
·telemetry data storage 18:81d

RELATED ENTRIES in the *Ready Reference and Index:* for

computer science: see computer memory; data processing; digital computer; languages, computer; program, computer
library procedures: catalog; cataloging; classification; documentation
other: indexing; microcopy

information theory 9:574, deals with the mathematical laws governing systems designed to communicate or manipulate information. It principally concerns quantitative measures of information and the capacity to transmit, receive, store, and otherwise process information itself.

The text article covers central problems of information theory; measurement, encoding, and transmission of information; coding for error correction; band limited channels; sources with distortion measures; filtering and prediction problems; and crytographic, liguistic, and other applications.

REFERENCES in other text articles:

·advertising design developments 1:111d
·algebraic structure theory 1:537f
·animal communications, channels, and evolutionary backgrounds 4:1010f
·automata theory 2:501d
·classification's practical function 4:693a
·combinatorics theory and method 4:948c
·communication processes and models 4:1005g
·communications channel data rate 18:96a
·landform entropy probability theory 10:625b
·language as vehicle of dissemination 10:655c
·library science related fields 10:867d
·linguistic applications and research 10:1012c
·mathematical calculation theory and use 11:694b
·measurement in communications 11:745d
·musical perception and meaning 12:666b
·optical and electronic systems analogy 13:616f
·optimization theory and method 13:632h
·psycholinguistic applications 10:1010g
·systems engineering tools and uses 17:973c
·writing development in communication 19:1033d

RELATED ENTRIES in the *Ready Reference and Index:*

band limited channels; capacity of a channel; encoding of information; error correction coding

Information Theory and Esthetic Perception (1966), book on music and perception by Abraham Moles.

·musical symbols and sonic objects 12:666a

informe de Br die, El (1970; "Doctor Brodie's Report"), short-story collection by Argentine writer Jorge Luis Borges.

·allegorical folk-tale style 3:41e

infrahyoid muscles, in human anatomy, muscles that support the hyoid bone to the sternum, clavicle, and scapula.

·skeletal function as muscle anchor 16:815d

infraorbital foramen, in human anatomy, the opening of the infraorbital canal on the anterior surface of the maxilla.

·skeletal structure of face 16:815f

infraorbital nerve, maxillary division of the trigeminal nerve.

·anatomic relationships and functions 12:1019b

infrared analyzer, device that uses infrared light to analyze the chemical composition and structure of a substance.

·chemical monitoring instrumentation 9:634c
·clay mineral types and structure 4:700e

infrared light, that portion of the electromagnetic spectrum adjacent to the long wavelength, or red end of the visible light range. Invisible to the eye, it can be detected as a sensation of warmth on the skin. The infrared range is usually divided into three regions: near infrared (nearest the visible spectrum), with wavelengths 0.78 to 3.0 microns (a micron, or micrometre, is 10^{-6} metre); middle infrared, with wavelengths 3 to 30 microns; and far infrared, with wavelengths 30 to 300 microns. Most of the radiation emitted by a moderately heated surface is infrared light; it forms a continuous spectrum. Molecular excitation also produces copious infrared radiation but in a discrete spectrum of lines or bands.

infrared photography, taking photographs in infrared light. The process requires the use of film that is sensitive to such light, and lens systems in the camera that will transmit it.

·agricultural need determinations 1:351a
·color reversal process 12:544a
·hydrologic movement analysis 9:114f
·light and temperature measurement 14:344d
·mapping of coastal features 11:482e
·physical geography application 7:1050f

infrared radiation: *see* electromagnetic radiation.

infrared radiation injury, harmful effect of heat rays on the tissues. *See* burns.

infrared sensor, device that will detect or sense the presence of infrared light.

·ground surface surveying 7:80e
·military detection technology 19:599d

infrared sources, astronomical 9:580, objects of several kinds that radiate measurable quantities of energy in the infrared region of the spectrum. They include the Sun and planets, some cool stars, the centre of the Galaxy, and external galaxies.

The text article surveys special methods used to study these sources. Each group of astronomical objects and an interpretation of the results from this relatively new branch of astronomy are covered.

REFERENCES in other text articles:

·dark nebula emissions 12:931g
·Galaxy sources and properties 7:842d
·Jupiter's dark areas and belts 10:349c
·radiometric magnitude determination 17:589g
·surface properties of planet Mercury 11:920b *passim* to 921e

infrared spectroscopy, that branch of spectroscopy involving infrared light. *See also* spectroscopy, principles of.

·chemical analysis instrumentation 9:643c *passim* to 644e

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the growth of strong nationalism and theological liberalism—the Ultramontanists were opposed by those, such as the Gallicans, who wished to restrict papal power. The Ultramontane Party triumphed in 1870 at the first Vatican Council when the dogma of papal infallibility was defined as a matter of Catholic belief.

·Bossuet's influence on French religion 3:54g
·Jesuit support and Gallican opposition 7:631c
·papacy and centralization of church power 13:961c
·Pius IX's position 14:484e

Ultras, French royalist faction that agitated for more authoritarian rule during the Restoration period.

Ultrasonics and infrasonics 18:840, science of sound waves having a frequency above (Latin *ultra*, "beyond") or below (Latin *infra*, "beneath") the range of the human ear.

The text article is divided into four principal sections: (1) general principles of ultrasonics, including principal forms of stress waves (longitudinal and transverse, or shear) and their applications, which may be classified as low energy and high energy; (2) lower-power applications such as flaw detection, thickness gauging, stress measurement, and ultrasonic cameras and holographs; (3) high-power applications, as in cleaning factory exhaust gases by vibration to coagulate suspended particles, in ultrasonic soldering irons, and in medicine as a surgical tool; and (4) infrasonics, the sources of the waves (chiefly earthquakes), and their study and use in determining properties of rocks, in mineral and oil surveys, and as a warning system for volcanic eruptions.

REFERENCES in other text articles:
ultrasonics
·diagnosis of heart disease 5:695a
·gas relaxation time experiment 7:921f
·industrial applications of acoustics 17:34b
·industrial measurement instrumentation 9:639d
·material flaw testing 11:630c
·metal cutting by vibration 11:265b
·metal removal processes 11:621e
·metal testing and vibration pattern 11:1077g
·neurological examination techniques 12:1043c
·piezoelectric cleaning device 14:462g
·plastic welding processes 14:522f
·radiologic tissue study 15:460e
·relaxation study and perturbation methods 15:590h
·semiconductor cutting method 16:516h
·superconductor properties research 17:815e
·surgical application and techniques 17:819c
·ultrasonic tissue scanning 15:464e
·weld inspection with high-frequency sound 19:741f

ultrasound, periodic pressure variations or vibrations of the same physical characteristics as sound but with frequencies above the range of human hearing, or beyond about 20,000 vibrations per second.

ultrastructure, the invisible ultimate physicochemical organization of protoplasm.
·morphologic research advances 12:452d

ultraviolet lamp, device for producing electromagnetic radiations in the wavelengths between visible light and X-rays. The sun's rays are rich in such light, sometimes referred to as black light because it is not visible to the naked eye. The ultraviolet lamp usually consists of an electric discharge lamp with material that yields radiations at the desired wavelength. Ultraviolet lamps are usually housed in quartz or special glass that passes ultraviolet radiation more readily than ordinary glass.

Ultraviolet lamps were developed for medical use after the germicidal qualities of ultraviolet light were discovered about 1900 by the Danish physician Niels Ryberg Finsen. Modern lamps are also used in industry and research, in producing artificial suntans, and in creating special effects in lighting stages and displays with fluorescent materials.
·egg spoilage detection 6:443f

ultraviolet light, that portion of the electromagnetic spectrum adjacent to the short wavelength, or violet end of the visible light range. Often called black light, ultraviolet light is invisible to the human eye, but when it falls on certain surfaces, it causes them to fluoresce, or emit visible light. Ultraviolet light is produced by high-temperature surfaces, such as the Sun, in a continuous spectrum and by atomic excitation in a gaseous discharge tube as a discrete spectrum of lines. The ultraviolet spectrum is usually divided into two regions: near ultraviolet (nearer the visible spectrum), with wavelengths 2000 to 3800 angstrom units (one angstrom is 10^{-10} metre, or 0.1 nanometre); and far ultraviolet, with wavelengths 100 to 2000 angstrom units.

ultraviolet radiation injury, tissue damage and changes produced by ultraviolet radiation, an electromagnetic wave frequency beyond visible light. This radiation can be emitted from the sun, mercury vapour lamps, and high intensity lights. The natural and most frequent form of ultraviolet energy encountered is solar radiation; the intensity varies with the season and time of day. Ultraviolet lamps are used for medical and industrial purposes such as sterilization of instruments and catalyzing of chemical reactions.

Ultraviolet radiation can produce direct and indirect effects upon the body. The direct effects are limited to the surface skin because the rays have low penetrating power. Indirect effects are the systemic changes secondarily caused by the skin's reaction to ultraviolet radiation. The skin recovers from the direct effects except in cases in which cancer develops; these reversible changes include reddening of the skin (sunburn), pigmentation development (suntan), and progressive adaptation to heavier radiation doses. After exposure to ultraviolet, reddening of the irradiated parts occurs in one to seven hours. Ultraviolet burns can be mild, causing only redness and tenderness, or they can be so severe as to produce blisters, swelling, seepage of fluid, and sloughing of the outer skin. The blood capillaries (minute vessels) in the skin dilate with aggregations of red and white blood cells to produce the red coloration. The outer skin cells may be seriously damaged or destroyed, with the liberation from cells of fluids and histamine (a nitrogen compound that plays a role in inflammation) into the blood and surrounding tissue. Nerve cells in the skin react to the increased pressure and heat by causing pain. As the damaged skin is replaced, a fibrous scar tissue temporarily forms that is thicker than the original skin layer. Cells in the deeper tissue portion of the skin contain pigment granules. When activated by ultraviolet radiation, the pigment is transferred into newly formed cells that migrate to the surface of the skin. When these cells die, the pigment is removed. Suntan produced by solar energy forms a reddish-brown colour, while that from artificial sources is more yellowish-tan; suntans may remain for several months after the exposure to ultraviolet. The degree of pigmentation is directly related to the length of ultraviolet exposure and the body's inherent ability to produce pigments. Tanning is a natural body defense to help protect the skin from further injury.

Constant exposure to sunlight, as with farmers and sailors, induces thickening of the skin, more rapid skin aging, and a much higher frequency of skin disorders, including cancer. There is an increase in skin temperature, skin respiration, and skin cholesterol (fat) after ultraviolet radiation. Similarly, there is a decrease in pain sensitivity, perspiration, and mineral levels. Protective devices include clothing, oils, ointments, and lotions; most of these reflect the radiation or reduce its penetration.

The eyes may also be directly affected by ultraviolet; swelling, inflammation, ulceration, and tumours have all been attributed to severe or repeated exposures. The eye can not adapt to ultraviolet rays as can the skin; coloured glasses are the recommended means of protection.

The indirect effects of ultraviolet radiation are for the most part caused by the release of histamine by the damaged skin cells. The respiratory tract is more susceptible to bronchitis and pneumonia, and calcified scar tissue has been found in the lungs after overexposure to ultraviolet rays. Histamine stimulates the stomach to produce more secretions and a stronger acid concentration than normal; this, in turn, leads to inflammation of the stomach lining, or ulcers. The circulatory system shows a fall in blood pressure but an increase in red blood cells, white blood cells, and clotting proteins. In general, the body's metabolism may change because of stimulation of endocrine glands; there may be loss of weight, increase in appetite, reduction in respiration rate, and less fatigability. Ultraviolet radiation is generally not lethal to the human body, but it can kill individual tissue cells and such organisms as bacteria.
·eye injuries from light 7:122h
·human genetic changes and consequences 7:1005c
·radiation injury to skin and eyes 15:417a
·skin changes in aging 16:846a

Ulúa River, Spanish RÍO ULÚA, in northwestern Honduras. Its headstreams rise deep in the central highlands, draining much of northwestern Honduras. The Ulúa proper, about 150 mi (240 km) long, is formed by the union of the Jicatuyo and Mejocote rivers, northwest of Santa Bárbara. It flows northeastward through Santa Bárbara, Cortés, and Yoro departments, forming the border between the last two. Emerging from the highlands, it enters the Sula Valley, once famous for its banana plantations, and becomes navigable. The Ulúa enters the Gulf of Honduras east-northeast of Puerto Cortés.
15°56′ N, 87°43′ W
·map, Honduras 8:1058

Uluas, one of the major Indian tribes of what became El Salvador before the Spanish conquest.
·pre-Columbian and present conditions 6:733e
·tribal distribution map 3:1107

Ulūgh Beg (b. 1394, Solṭānīyeh, Iran—d. Oct. 27, 1449, Samarkand, now in Uzbek S.S.R.), grandson of the Asian conqueror Timur whose primary interest was in the arts and intellectual matters and under whose brief rule the Timurid dynasty of Iran reached its cultural peak.

His father, Shāh Rokh, captured the city of Samarkand and gave it to Ulūgh Beg, who made the city a centre of Muslim culture. There he wrote poetry and history and studied the Qur'ān. His greatest interest, however, was astronomy, and he constructed an observatory (begun in 1428) at Samarkand. In his observations he discovered a number of errors in the computations of the Roman astronomer Ptolemy, whose figures were still being used by astronomers of the time.

Ulūgh Beg was a failure in more mundane affairs. On his father's death in 1447 he was unable to consolidate his power, though he was Shāh Rokh's sole surviving son. Other Timurid princes profited from his lack of action, and he was put to death at the instigation of his son, ʿAbd al-Laṭīf.
·Samarkand intellectual climate 18:794f
·Timur dynasty cultural heritage 18:425b
·Timurid culture and conflicts 9:600c

Uluguru Mountains, range in eastern Tanzania, eastern Africa. Rising about 5,000 ft (1,524 m), they stand isolated 120 mi (193 km) west of Dar es Salaam.
7°10′ S, 37°40′ E
·location and formation 17:1025g
·map, Tanzania 17:1026